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The Improvement of Cultivated Plants.

SOME months ago, in speaking of the proper work of experiment stations, we ventured the opinion that some of the elaborate comparative tests made of different varieties of fruit and vegetables might be left to individual cultivators. The proper region for station effort lies beyond the field which can be effectively worked by ordinary farmers and gardeners. In all problems which demand trained observation, scientific accuracy, costly apparatus and the accumulation and classification of data which it requires years to gather and sound judgment to interpret, the expert scientists of the stations ought to be able to investigate effectively and report intelligently, while to answer such questions would be impossible for ordinary farmers and fruit-growers. Any grower of Strawberries, however, is competent to test a dozen or so of the best varieties on his own land every year, and to decide for himself as to their comparative value for his purposes. Indeed, he will be compelled to decide for himself at last, because the results of one or two seasons' trial on the station-grounds, which may differ entirely in soil and exposure from his own, furnish no guarantee whatever that the plants will behave with him as they did when reported on. Of course, the labors of the stations in this field are not actually useless; nevertheless, it seems clear that organizations of trained workers can render agriculture a higher service by devoting themselves to the discovery of the broader truths of science upon which the successful practice of agriculture and horticulture must always be based.

We have recently received a letter from an officer in one of the stations, in which, after alluding to our position on this point, the writer asks if we do not consider the improvement of fruits and vegetables an object to which the experiment stations could profitably address themselves. Beyond question it is. But the testing of a hundred varieties of Tomatoes or Strawberries every year at several different stations has not enriched our horticulture with any improved fruits or vegetables, so far as we know, and has done little to popularize any new plants which originated elsewhere. But when any station begins some systematic experiments in the breeding of new plants, and perseveres in the work long enough to establish any principles, we may hope to receive some instruction. This is a work which requires some knowledge of the laws of heredity and variation, and since no decisive answer to the inquiries made of nature can be obtained until after a series of years, this certainly is a field of effort which the stations could occupy with wisdom and profit.

All the fruits and vegetables and grains that are grown in our farms and gardens have been bred up from their wild condition. If they had originally any quality which was useful to man, by proper care and selection this has been strengthened until it has become a fixed element in their constitution, which could be handed down to succeeding generations. Useful plants have been perpetuated and improved in this way, and the good qualities of each of them have been multiplied and established as a part of their hereditary nature. Of course, this improvement has not been brought about systematically and scientifically, but by the long and bungling efforts of man through generations. It has taken centuries to produce the best varieties of Cabbage and Cauliflower and Rutabaga from the wild plant on the western shores of Europe, and the Tomatoes and Potatoes in our gardens, when compared with the wild plants in the mountains of South America, will show what even unskilled selection can accomplish in the course of years. But these results could have been reached much sooner if the selection and crossing had been made by men of adequate knowledge and with a well-defined purpose. In the instructive paper read by Monsieur Henri L. de Vilmorin at the Congress of Horticulture, in Chicago, last summer, an example is given to show how the wild form of a plant can be changed if it receives kind treatment at the hand of man and is helped to adapt itself to his purpose. The changes may be slow and gradual at first, and often scarcely noticeable, but if the effort is persisted in these modifications will become greater and greater, and they will in time become much more rapid than the earlier ones. The account of this experiment, which Monsieur de Vilmorin has been conducting for more than twenty years, is here given in his own language:

> Since 1872 I have been cultivating one of our Parsley-worts, Anthriscus sylvestris, a European weed, in order to change its slender and much-forked roots into fleshy, straight and clean roots like those of the Parsnip. Among the first package of roots raised from wild seeds a dozen were selected which had a tendency in their roots to larger and straighter bodies. Each root was planted separately and its seed harvested separately. Of a dozen lots obtained, eight or nine were discarded, and roots were selected only from such lots as exhibited some trace of variation. The next year a dozen roots or so were chosen, and a drawing of each root was made, which was planted separately and its seed harvested separately, as before. I have sketches of all these roots selected, so that it is possible to follow every stage of variation from each plant living at this day. For the first ten years the changes were slight, but now they are more and more marked with every generation, and in some of the lots the straight and smooth roots are the most numerous. My object was not to create a new vegetable, as the roots of Anthriscus sylvestris have such a strong taste of camphor as to be quite uneatable, but simply to show that careful and continuous selection could quite transform a wild plant in years which do not equal a quarter of the span of many human lives. Like results had been shown by my grandfather with the Wild Carrot, only these were open to controversy on account of possible crosses between garden varieties and the wild strains. But no such objection can be raised in the case of my Parsley-wort.

This experiment indicates a line of work which might be well taken up by any station, but it will be observed that it is altogether different from the testing of a hundred chance varieties of any plant, especially when nothing is known of their pedigrees. How much a practical grower can accomplish by taking advantage of these laws of variation and heredity is strongly shown in the production of the Osage Melon in a market-gardening region a few miles from Chicago, on the Michigan shore of the lake. Last year Professor Bailey explained in this journal (vol. vi.,

p. 412) how, by persistently and uniformly selecting year after year with an exact and unvarying ideal in mind, aiming constantly at precise shape, size, color, flavor and texture, Mr. Roland Morrell at last secured a Melon which exactly met the requirements of that region. A recent bulletin of the Agricultural Experiment Station of New York, at Geneva, records an attempt at the systematic breeding of Strawberries, although nothing has yet been learned beyond the fact that one particular variety, Johnson's Late, seems to be a desirable parent when an attempt is made to breed late varieties of Strawberries, and that certain other varieties gave a large proportion of excellent seedlings. How little orderly work has been done in this direction will be understood from the statement in this bulletin, that of the hundreds of varieties of Strawberries that have been introduced into cultivation the parentage of but very few is known. The testing of any number of chance seedlings will be of very little account, and will add nothing whatever to the sum total of our knowledge of horticultural practice or natural law. If, however, some one good variety is chosen, and selections from its seedlings is made for twenty years in succession as carefully as those made by Monsieur Vilmorin in France, or by Mr. Morrell in Benton Harbor, we might reasonably expect some improvement in the fruit. At all events, we should be accumulating data from which to deduce some of the laws in accordance with which certain qualities in plants can be modified and transmitted, so that we can breed plants to a given standard, with greater assurance of success.

Notes for Mushroom-eaters.—I.

DURING the past summer an unusually large number of cases of poisoning from eating fungi have been noticed in the papers. If one may judge by their names, a large proportion of the sufferers were foreigners, and it is probably correct to infer that they were recent immigrants from countries where fungi form a more important article of food than in our country. A singular circumstance is that in almost all parts of the north and west the past summer was unusually dry, in some places very dry, and there have been comparatively few of the large, fleshy fungi which are selected for food; consequently one would have supposed that the number of persons tempted to eat fungi would have been smaller than usual. The comparative scarcity of the species generally eaten may possibly have led fungus-eaters to be less discriminating in the species gathered and to attempt to supplement the scanty crop of the species which they knew by experience or tradition to be edible by other forms which they hoped might be equally good. Since the species commonly recognized as edible in the northern states are, in great part, identical with the common edible species of Europe, it seems strange that foreigners, who are supposed to recognize without difficulty the edible forms in their native countries, should have difficulty in distinguishing the same forms here, for, in spite of the number of species of fungi indigenous to this country and not found in Europe, the recognition of the traditional edible species is no more difficult, and the number of poisonous species which might be mistaken for them is no greater here than there.

Nevertheless, it must be admitted that the number of persons poisoned by eating Toadstools, to use the common name, is on the increase in this country, and the increase is mainly due to the increasing number of ignorant foreigners. As a rule, native Americans are not often fungus-eaters, for, apart from their dread of being poisoned, fungi are not to their taste, especially when submitted to the treatment of the ordinary American cook. There is, however, a constantly increasing class of well-to-do Americans who are beginning to make use of our native fungi for the table, and they frequently ask for information as to the means of distinguishing the edible from the poisonous species. The present notes are an attempt to furnish to that portion of the public represented by the readers of Garden and Forest information on the subject, which shall be, as far as possible, free from technicalities familiar to the expert botanist, although accurate as far as it goes. The problem of enabling the uneducated masses to distinguish at sight our edible and poisonous forms is one which is too difficult to be attempted at present. Even in countries like France, where for many years there have been excellent popular works on the subject, the attempt to instruct the uncultivated classes has met with little success, and it seems wiser to try first to give the necessary instruction to educated persons, trusting that in time they may spread the information among the more ignorant, who, as is well known, learn more quickly by word of mouth than from books and tracts.

The popular belief in this country is that the larger, fleshy fungi may be divided practically into Mushrooms, or edible species, and Toadstools, or poisonous species. Hence the question is very often asked, How can one tell a mushroom from a toadstool? A botanist is at a loss how to answer this question, since the assumption implied by the question that there are two distinct classes, one good and the other bad, is not at all correct. To speak more accurately, a toadstool is any sort of a fleshy fungus shaped more or less like an umbrella, that is, with a stalk and more or less expanded top, no matter whether it is edible or poisonous. The Mushroom of commerce, the one sold in the market and cultivated in beds, is one particular species of toadstool, Agaricus campestris, a species also found growing wild. Although this is the only universally cultivated species in Europe and this country, a considerable number of other species of Toadstools are known to be edible, a much larger number are, as far as we know, not poisonous, and a certain number are poisonous to some extent, while a comparatively small number are actually known to be highly poisonous. With fungi, as with other articles of food, edibility is a comparative term. Some species, as Agaricus campestris and Coprinus comatus, would be relished by most persons; others would be liked by persons having a natural fondness for fungi, but would not be considered worth eating by others; while a large number of species are harmless, but so unpalatable or so difficult of digestion that they would be rejected by all except the very small class of those who may be called fungus-cranks, who feel it their duty to like all fungi, except those absolutely poisonous.

To describe all our different forms large enough to be noticed by those who are not special botanists, and tell whether they are poisonous or not, would be quite out of the question, for in any locality there are hundreds of them. In fact, in the case of many of our species there is as yet no scientific record of their edible properties. We know only that some species are certainly edible, and that others are certainly poisonous, but with regard to the rest we can only infer from their botanical relations to the better-known species that they are likely to be poisonous or otherwise. The details can only be mastered by the few who make a special study of the subject. Here we can only point out definitely a few of the commonest of the best edible forms, with hints as to the poisonous forms which might be confounded with them, and state a few rules which should be learned by all who desire to collect fungi for food. The rules are empirical, and there are exceptions to them, but they have a certain practical value. There is nothing novel about them, for they have been given over and over again in books, until botanists wonder why they are not more widely known. For the understanding of the rules it is necessary, as a preliminary step, to call attention to the general structure of the fungi known as toadstools.

A toadstool is first recognized as a small, more or less egg-shaped mass on the surface of the ground, trunks of trees or other substrata. This stage is popularly called the "button." The button, if the weather is favorable, quickly shoots up into the full-grown toadstool. It is often said that toadstools grow in a night. This is frequently true, if by the expression "grows up" we mean

the development of the toadstool from the button, but it is not at all true if, as is generally the case, it is meant that the complete development of a toadstool is accomplished in that time. The buttons arise from a tangled mass of delicate threads, known to botanists as the mycelium, and to mushroom-growers as the spawn, which is found in the ground or substance on which the toadstool is growing, and it may be weeks, months, or even years, before the spawn begins to produce buttons. The threads of which the spawn is composed extract from the substratum and store up the material by means of which the rapid growth of the toadstool from the button is accomplished. Comparing roughly the function of the spawn in the ground and that of the toadstool above ground with those of the organs of higher plants, the spawn may be said to correspond to the roots, stems and leaves, while the toadstool itself, which is merely an arrangement for bearing the reproductive bodies, or spores, may be compared to the fruit containing the seeds.

Harvard College. *W. G. Farlow.*

Exotic Trees and Shrubs for Florida Gardens.—I.

ABELIA RUPESTRIS, a native of China, is a dense evergreen shrub, which grows to perfection in Florida, even on the poorest sandy soil, withstanding droughts and occasional frosts with impunity. The flower-buds and the outside of the blossoms show a pale rose-color, while the inside of the tube-like flowers is white. They exhale a delicate fragrance, and are produced from June to late autumn in great abundance. The Abelia, in Florida, grows six or eight feet high and to an equal breadth, and is beautiful at all seasons, especially when covered with flowers and surrounded by humming-birds. The variety, Grandiflora, which originated in the gardens of Mr. Thomas Hanbury, La Mortala, Italy, has larger and finer flowers than the type. Among other Abelias which should be grown in Florida are A. floribunda, a native of Mexico, with rosy-purple flowers in axillary clusters—it is a very difficult shrub to obtain in this country; A. serrata, from China, with pale red flowers, and A. triflora, of Hindostan, with pale yellow flowers.

Acacia Farnesiana, Opoponax, Papinac, when carefully grown, is a very handsome tree; left to itself it may assume a straggling form. Its pinnate foliage is delicate, and the yellow flower-balls, appearing in abundance throughout spring, summer and autumn, are deliciously scented. I have seen trees fifteen to sixteen feet high, with a head twenty to twenty-two feet in diameter, not more than seven or eight years old. If this tree receives some care and a little fertilizer it grows rapidly. I have noticed this Acacia in south-western Texas, far from the habitations of man. Its native country seems to be unknown, but the first plants were introduced to cultivation from San Domingo.

Albizzia Julibrissin, the Abyssinian Locust, Silk-tree or Mimosa, here attains a height of twenty-five to thirty feet. Early in the season it is literally covered with white flowers, which are strongly fragrant. It grows well in sandy soil, and is much planted as an ornamental tree as far north as Augusta, Georgia, and will live in sheltered places as far north as New York. It inclines to a habit of growth which is too open, but pruning will insure a compact head. The Australian Acacias, which grow exceedingly well in California, do not seem to find the Florida climate congenial.

Aralia papyrifera, from the island of Formosa, thrives well, and its fine tropical appearance makes it valuable for producing landscape-effects. According to Mr. E. H. Hart, of Federal Point, in this state, it delights in a moist, half-shady spot; it is a good plant for hiding unsightly spots. When in bloom it is superb, and every one stops to admire it.

Ardisia crenulata, so much prized for its bright berries in northern conservatories, delights in shade and in rich soil, and the same is true of Skinnia oblata, S. Japonica, Aucuba Japonica and Achania malvaviscus. Abutilons of all kinds do well everywhere in south Florida, if carefully fertilized and watered.

Bauhinia acuminata thrives admirably on my place and blooms, when quite young, from May to December. The flowers are pure white and about three inches in diameter. B. alba is a taller grower, and B. purpurea is an exquisite winter-flowering small tree or shrub. The flowers vary in color from whitish to purple. Being of a very robust habit, this Bauhinia in a few years attains a height of fifteen feet. Although not perfectly hardy, the Bauhinias are well adapted to the sandy soil, and sprunt readily from the root-stock when frozen down. They are natives of the tropics.

Cestrum aurantiacum, a native of Central America, attains a height of ten feet in one season, flowering profusely in October and November. If cut back in spring it forms a compact head, the orange-yellow flowers appearing in terminal corymbs. My plant is cut down each winter by frost, but it sprunts readily in spring from the root. Cestrum Parqui, the Night-blooming Jasmine, from Chili, is one of the most interesting ornamental shrubs seen in Florida gardens. It grows to a height of fifteen feet and as much in diameter. The tubular flowers, which appear in dense corymbs, are greenish-white as they open at sundown and fill the air throughout the night with a delicious fragrance. A Florida moonlight night in late April and May is a season of enchantment. At this time the great flowering Magnolia has opened its white flowers, the China-trees and Orange-trees, the Night-blooming Jasmine and Roses are in bloom, and the indescribable melody of the mocking-bird's night song mingles with gales of fragrance. Cestrum Newelli, C. elegans and C. Bondouxi, all with red flowers, grow well on high Pine-land; while the hybrid Cestrum, La Mortola, is an exceptionally beautiful shrub with deep green foliage, tinged with purple. The flowers, which appear in dense terminal corymbs and in the axils of the leaves, are of a bright orange-yellow and exhale a spicy fragrance at night. The plant is robust and will prove a great acquisition for Florida. I raised it from seed obtained from Mr. Thomas Hanbury, who pronounces the plant a hybrid between C. elegans and C. Parqui.

Choisya ternata, the Mexican Orange-flower of the English, and the Clover-leaf Shrub of German gardens, is a beautiful plant when grown successfully. The leaves are clover-like, and the terminal white flower-trusses resemble Orange-blossoms. It attains a height of six and more feet, and is a native of Mexico. The specimens on my place which were planted in autumn looked well throughout the first winter, but did not grow in spring, and finally died. For ornamental planting in the Gulf states this would be a very decorative shrub. It has proved hardy in the southern and western parts of England with the protection of a wall.

Chorizema varium, C. illicifolium and C. cordatum all form beautiful shrubs in the greenhouses of the north. Of the first species I have seen specimens, four feet high and six feet through, literally covered with yellow and red pea-shaped flowers. All the Australian shrubs and trees thrive here except Grevillea robusta and the various species of Eucalyptus, which cannot for any length of time endure dryness at the roots. They must be well watered in the dry months. With a little care all these, as well as the beautiful Banksias, Dryandras, Callistemons, Melaleucas, Metrosideros, Epacris, from Australia, and the very beautiful Leucadendron argenteum, of the Table Mountain of the Cape of Good Hope, ought to flourish in Florida.

Clerodendron fragrans, a native of China, grows like a weed, and is found already on waste grounds and on roadsides. It spreads from the roots in such a way that soon large masses are formed which are not easily kept within bounds. The leaves have a very objectionable smell, but the fragrant, double, rose-like flowers, which are crowded into very compact corymbs, are very beautiful. In good soil the plant reaches a height of six feet. C. viscosum, of India, is a tree with very showy white flowers, the calyx of

which is rosy red. It grows rapidly in the open air even in the northern part of the state. C. Siphonanthus, of India, is one of the most common plants in the gardens of Florida. It grows eight to ten feet high, without branching, and, though not very beautiful, is always conspicuous, especially when covered with its dark bluish terminal clusters of berries.

Milwaukee, Wis. *H. Nehrling.*

New or Little-known Plants.

Lonicera Korolkowii.

THIS handsome plant, which is conspicuous throughout the summer from the color of the pale glaucous green foliage, quite unlike that of the leaves of any other Honeysuckle in the collection, was sent to the Arboretum in 1881 by the late Alphonse Lavallée, of Segrez, in France, who had obtained it through Colonel Korolkow, of Moscow. Being unable to refer it here to any described species, it was sent to the Herbarium at Kew for determination, and, at our request, Dr. Stapf, finding it undescribed, has prepared the following description to accompany the illustration on page 35 of this issue, taken from a drawing made by Mr. Faxon in the Arboretum.

Lonicera Korolkowii has grown here into a stout spreading bush six or eight feet tall; here it flowers about the 1st of June and ripens its fruit early in the autumn. *C. S. S.*

LONICERA KOROLKOWII, Stapf, (spec. nov.) Affinis L. Xylosteo, L., et L. Tataricæ, L., v. puberulæ, Reg. et Winkl., sed differt a priore foliis parvis (10–15 lin. longis), indumento tenuiore et parciore, bracteis bracteolisque minoribus, calycis lobis lanceolatis acutis, corollæ tubo tenuiore longiore glabro, labio supero multo profundius fisso, lobis elongatis, staminibus in parte libera vix pilosis, baccis minoribus aurantiacis; a posteriore foliis paulo minoribus utrinque fere semper acutis, nunquam truncatis vel subcordatis, bracteis brevioribus, bracteolis et calycis lobis eximie ciliatis, corollæ luteo-albæ tubo paulo longiore, lobis angustioribus.

Frutex 6-8 ped. altus ramis novellis tenuiter villosulis interdum purpurascentibus, vetustioribus griseis. *Folia* ovata vel elliptica, utrinque acuta, rarissime basi vel apice rotundata, 10-15 lin. longa, 4-8 lin. lata, membranacea, plus minusve glaucescentia vel pallide viridia, utrinque minute pilosula, imprimis in nervis, supra mox glabrata, nervis lateralibus utrinque 4, rarius 3 vel 5, valde obliquis, paribus 2 infimis approximatis, reticulatione supra leviter impressa, subtus minus distincto; petiolus gracilis, 2-3 lin. longus. *Pedunculi* graciles, minute villosuli, 4-5 lin. longi. *Bracteæ* filiformes, ciliatæ, bracteolis vix æquilongæ. *Bracteolæ* lateraliter plus minusve connatæ, ovatæ, obtusæ, ciliatæ, ⅓ lin. longæ, ovario triplo previores. *Calycis* lobi triangulari-lanceolati acuti ⅓ lin. longi, ciliati. *Corolla* luteo-alba in alabastro elongato-clavata, 6-7 lin. longa, apice saepe parce puberula, tubo tenui, supra basin leviter sed distincte gibboso, glabro, 3-3½ lin. longo, labio infero lineari-spatulato, 5 lin. longo, 1 lin. lato, supero quadrilobo, lobis 2 intermediis oblongis vel obovato-oblongis, 2 lin. longis, lateralibus ad ⅔ separatis, lineari-spathulatis, 3-3½ lin. longis. *Filamenta* in parte corollæ adnata pilosa, in parte libera vix 2 lin. longa glabra vel subglabra, breviter exserta; antheræ lineares, 1½-1¾ lin. longæ. *Oviarium* ovoideum, saepe elongatum, glandulis perpaucis aspersum, caeterum glabrum, vix 1 lin. longum; stylus pilosulus. *Baccæ* liberæ, globosæ, 2½ lin. diametientes, aurantiacæ, calycis basi annuliformi coronata.

Turkestan, Koralkow.

I have indicated above the differences between L. Korolkowii and L. Xylosteum and L. Tatarica v. puberula, and need not repeat them. The typical L. Tatarica, L., is, of course, still more distinct in its being perfectly glabrous in all its parts. On the other hand, L. Korolkowii is very probably identical with the plant which was described by H. Zabel under the name of Lonicera floribunda Boiss. et Buhse in *Gartenflora*, 1889, p. 525, and figured by A. Rehder in *Gartenflora*, 1893, p. 103. Zabel's description especially fits L. Korolkowii, as represented by the specimens grown in the Arboretum of Harvard University. Rehder quotes Zabel's article and evidently intends to represent the same plant by his figure, and the only difference I find in comparing this with the specimens from which my description of L. Korolkowii was drawn, is that the corolla lobes are rather broader and the corolla altogether a trifle shorter in the former. But this may certainly be considered as insignificant, and we may safely assume the identity of L. Korolkowii and L. floribunda of Zabel and of Rehder. But Zabel as well as Rehder, and evidently also Dippel in "Handbuch der Laubholzkunde," were mistaken in referring this plant, which was introduced from Turkestan through the Botanic Garden at St. Petersburg, to L. floribunda, Boiss. et Buhse. Zabel, who first made this suggestion, states himself that he had not seen any authentic specimen of L. floribunda, Boiss. et Buhse, but had to rely on the plate, published in "Boissier und Buhse Aufzahlungder in Transkaukasien und Persien gesammeltau Pflanzeu," p. 107, t. 8. Buhse collected L. floribunda in two localities in the province of Mazanderan, on the Caspian Sea, at Warahusol and at Radkan, the latter south-east of Asterabad, in June and July respectively of 1848, both times in fruit only. From these specimens the original description and the figure were drawn. Ten years later the same plant was collected by Dr. Bunge early in March and a few miles northwest of Radkan, at Alfresh, not far from the lagoon of Asterabad. His specimens were in blossom, and it was from them that Boissier added the description of the flower in the "Flora Orientalis." One of Bunge's specimens is preserved in the Kew Herbarium. It is quite different from what was described and figured by Zabel and Rehder respectively under the name of L. floribunda, and approaches, in fact, so very much L. Tatarica that it is not easily distinguished. From L. Korolkowii it differs in the leaves, which are more rounded and almost truncate at the base, and hairy only beneath along the midrib, in the glabrous bracts, bracteoles and calyx lobes, which are quite those of typical L. Tatarica, and in the shorter corolla with broader lobes and a more pronounced gibbosity at the base of the tube. Rehder quotes also L. Tatarica, L. B. micrantha, Trautv., L. micrantha, Regel, as a synonym of his L. floribunda. If that be the case, the species described here would not be new. I have not seen authentic specimens of L. micrantha, Reg., but the descriptions of this plant by Trautvetter, as well as by Regel, and the description and figure of it in Dippel's "Handbuch der Laubholzkunde," pp. 232, 233, represent a plant with flowers only half the size of those of L. Tatarica (vig. 3-3½ lin., while they are 6-7 lin. in L. Korolkowii).

O. Stapf.

Foreign Correspondence.

London Letter.

ACACIA BAILEYANA.—This is a distinct and beautiful species which has recently been introduced into English gardens by means of seeds sent by Baron Sir F. von Mueller, the eminent Australian botanist. There are several good bushes of it in the Kew collection, and it is also grown in the Cambridge Botanic Garden, where it has lately flowered. It is of close, bushy habit, with stiff twiggy branches, thickly clothed with short, bipinnate, short-stalked leaves, as glaucous as those of A. dealbata, and with remarkably large glandules on the midrib. The flowers are in small-stalked, spherical heads, deep yellow, fragrant, and produced in large, elegant panicles on the ends of the branches. In Australia this species is said to form a small tree, fifteen feet high, of particularly graceful aspect, the gray bark of the trunk and branches and the silvery hue of the leaves being an excellent foil to the numerous panicles of golden yellow flowers. I have had a spray of flowers in water a week, and they are still fresh.

GRADERIA SUBINTEGRA. — This is a new Scrophulariad which has lately been found in south Africa. Seeds are now offered by Mr. W. Nelson, a nurseryman in Johannesburg, who describes it as "a very handsome and uncommon-looking plant—a trailer, herbaceous, three inches high, producing Gloxinia-like pink flowers, with lighter shade in the interior of the flower." A botanical description by Dr. Masters and an excellent figure of the plant are published in the *Gardeners' Chronicle* for December 30th. From these it is clear that this Graderia is a beautiful little plant, with an erect spike six inches long, closely packed with Pentstemon-like flowers, and very attractive in appearance at any rate. There is, however, the suspicion that this plant is one of many very beautiful Scrophulariads found in south Africa which have never, so far, been successfully cultivated because of their semi-parasitical habit. Such plants

are the Harveyas, Gerardias, Strigas, Buttonias and Cycniums, which, together with Graderia, belong to the tribe Gerardieæ, the members of which are, as a rule, more or less parasitical on the roots of other plants. We have tried most of the plants here mentioned at Kew, and still possess plants of Buttonia and Cycnium; but, although we manage to keep them alive, they do no good, and probably never will, until we get the host-plant to grow them on. Perhaps Mr. Nelson can supply the information which will enable us to grow the Graderia with success.

PORANA PANICULATA.—English gardening papers are recommending "Porona paniculata" on the strength of a paragraph which appeared recently in an American paper. I suspect Porana is meant, there being no such genus as Porona. P. paniculata is one of nine species of a genus of Convolvulaceæ. They are all natives of the tropics of Asia, P. paniculata being common in the jungles of India. It is cultivated in botanical collections in England, where it grows freely in a moist stove and produces, somewhat sparingly, large-branched panicles of small, dull white flowers. It would be attractive in the mass and probably is a useful garden-plant in countries where it can be grown out-of-doors. There is, however, a better species for the garden in P. racemosa, which is grown at Kew, and which is known as the Snow Creeper in India, where, according to Mr. C. B. Clarke, it is "a most beautiful plant, the masses of dazzling white patches resembling snow patches in the jungle."

NEUWIEDIA LINDLEYI.—This is an Orchid with flowers of very exceptional structure. The most marked peculiarity of Orchidaceæ is the consolidation of the stamens and pistil into one mass, called the column, and the suppression of two or one of the three anthers. But in Neuwiedia the stamens are perfect, quite separate, and they surround the stigma, which is as simple as that of a Lily. There is a plant of the above species in flower in the tropical Orchid-house at Kew. It was imported from Penang five years ago and is now a tuft of Curculigo-like leaves a foot long, with a central erect spike two feet high, half of it clothed with yellow flowers, each an inch long and subtended by a narrow green bract. The sepals and petals are as unlike the ordinary Orchid as are the other parts of the flower, being equal and similar, free, with the merest suggestion of a lip in one of the petals. Imagine a flower of Lachenalia perched on the top of a three-sided ovary, and with three instead of six stamens, and one has a good idea of the flower of this extraordinary Orchid.

Fig. 4.—Lonicera Korolkowii.—See page 34.

HARDY ORNAMENTAL FLOWERING TREES AND SHRUBS.—This is the title of a little book prepared by Mr. A. D. Webster, a forester, and author of several other little gardening works. It is intended chiefly as a guide to horticulturists in the United Kingdom, the term hardy being applied to

all trees and shrubs that thrive in the open air in some part or other of the British Islands. Mr. Webster has not attempted to describe the plants he enumerates beyond stating that they have large or small flowers of a certain color. Nor has he gone into details in cultural directions. His book may be recommended, as it contains the names and a little information about a great many plants which are not generally grown in the open air in England. It will also be of some service to American horticulturists, as it gives a good idea of the extent and variety of the material available in this country for the outdoor garden.

A Chat About Orchids.—The author of a book bearing this title, and recently published by Messrs. Chapman & Hall, is Mr. Frederick Boyle, a literary gentleman who for some years has taken an enthusiastic interest in garden Orchids, cultivating, chiefly with his own hands, I believe, a nice little collection of them in several small greenhouses in his garden at Croydon. The book is made up of articles contributed by Mr. Boyle to English periodicals, and written, as he says, to show that the delight of growing Orchids may be enjoyed by persons of very modest fortune and possessed of an ordinary amount of gardening skill. Professional cultivators will, no doubt, be tickled by Mr. Boyle's optimism, as shown in the following passage: "For one shilling the poor man can buy a manual which will teach him what species can be easily grown, and most of the things necessary for him to understand besides. An expenditure of five pounds will set him up for life and beyond, since Orchids are immortal. Nothing else is needed, save intelligence." Mr. Boyle has had considerable experience in writing to catch the public eye, and, no doubt, he has felt bound to use strong colors if he is to succeed in turning every householder with a "bit of glass" into an Orchid-fancier. Chapters on "My Gardening," "Orchid Sales," "An Orchid Farm," "The Lost Orchid" are pleasant and suggestive reading, as also are those on the different classes of Orchids into which they are divided for cultural purposes. From a professional standpoint, the last chapter in the book, which treats on "Hybridizing," is the most interesting and useful. There are also eight beautifully executed little colored plates, representing as many choice Orchids. The book is one for the drawing-room table, and exactly the kind of treatise to recommend to any one wishing to know something about Orchids, and what is sometimes called the Orchid fever.

Mr. Richard Spruce, the Brazilian traveler-botanist, who collected for Kew forty-five years ago, died this week at the age of sixty-six years. A Yorkshireman, the son of a schoolmaster, with plenty of what his countrymen call "go" in him, he won the interest of Sir William Hooker, Humboldt and others, and was sent, when only twenty-one years of age, to explore the River Amazon in the interest of commerce as well as science, a mission which extended over fifteen years. He crossed the continent from the Atlantic to the Pacific, collecting 7,000 species of plants, many of which were new to science, and some have since proved valuable to commerce. His papers on the Palms of the Amazons, published in the *Journal of the Linnæan Society*, are among the most valuable of his contributions to botanical literature. He retired on a Government pension some years ago, and devoted his leisure time to a study of Mosses, Liverworts, etc.

London. *W. Watson.*

Cultural Department.

Spraying Fruit-trees for Fungoid Diseases.

THIS subject is one so important to every one who attempts to grow fruit, that hardly too much can be written about it, and we, therefore, add to what was said last week some of the essential points in an address delivered before the New Jersey State Horticultural Society by Dr. Charles Parry:

Many fruit-growers use the Bordeaux mixture regularly on their Apple as well as Pear trees for fungoid diseases, and it is, no doubt, beneficial, not only in securing finer fruit the year it is used, but, by keeping the leaves healthy and hanging late on the trees, more fruit-buds are formed and a heavier crop of fruit is secured the following year. There are some plant-diseases, however, that seem proof against the Bordeaux mixture—for instance, the mildew of the Peas. When sown early these escape the mildew and mature a good crop, but it is well known that those sown in May and June are of very little account. Experiments tried the past season showed that vines sprayed with the Bordeaux mixture once a week suffered quite as much as those not treated. Perhaps one reason of this is that the Pea-leaf is so smooth that the mixture will not stick to it, but rolls off and leaves the vine as dry as before the application. The effect on Gooseberry-foliage was not so good as we should expect; three applications were made a week apart, but the foliage remained on the treated vines but very little longer than on the untreated. The effect on Lima Beans and Potatoes was good, keeping the foliage healthy and increasing the crop. Experiments on Sweet-potatoes to prevent the black-rot seemed to do good, but further work is necessary to secure positive results. But, whatever the effect of the Bordeaux mixture upon other crops, there is no question that it has a magical effect upon the Grape. So uncertain had the grape crop become in some parts of New Jersey from the rot and mildew that many growers grubbed out their vineyards, but the mixture has so changed the state of affairs that the grape crop is now one of the most certain and reliable grown, and many growers who grubbed out their vines a few years ago are now planting anew.

The question of nozzles is important, and it is worthy of note that the Vermorel, which was one of the first introduced, has not yet been surpassed, for grapes at least. In economy of material, in evenness of distribution and in simplicity of construction it is very hard to improve upon it. For spraying trees there are several good nozzles, the McGowan being one of the best. This nozzle has the important feature of freeing itself of small obstructions that would clog other nozzles.

Our improved method of making the Bordeaux mixture consists of using prussiate of potash to determine the amount of lime necessary to neutralize the sulphate of copper, instead of weighing a small amount of lime and slacking it each time. It is difficult in some places to get small quantities of fresh lime, and a large quantity, if not used soon, spoils. By keeping on hand a bottle of the solution of prussiate of potash, costing five or ten cents, a bushel or more of lime can be slacked at a time. Then, after the sulphate of copper is dissolved, add the milk of lime until the test shows there is sufficient, then add enough water to make the required quantity, say about eight gallons for each pound of sulphate of copper. A few drops of the prussiate of potash in the sulphate of copper solution give a deep brown stain; as the lime is added this stain shows less and less, and when it no longer appears there is enough lime added. The old plan of dissolving the sulphate of copper was to use hot water or to put the lumps in the bottom of a tub or barrel and stir them. By this plan the water on the bottom became saturated with the copper salt until it could dissolve no more, and being heavier than the pure water it remained on the bottom and prevented further solution, so that it took days sometimes to dissolve large lumps of the copper salt. The proper plan is to place the lumps of sulphate of copper in a grape basket and suspend it in the water as near the top as possible. As the water takes up the salt it becomes heavier and sinks, while a fresh supply surrounds the salt. Thus a constant circulation is maintained, and it is surprising how quickly the lumps are dissolved.

The effects of the Bordeaux mixture were strikingly shown the past season in a large orchard of Bartlett Pear-trees affected with leaf-blight. This orchard blooms freely every spring, but persistently fails to bear fruit. A series of experiments upon the orchard with various fertilizers, running from one-half ton to three tons per acre, was interesting, but was not effectual in producing fruit. The leaves in this orchard generally fall in July and August from leaf-blight. To counteract this, a series of plots were sprayed with different mixtures, a different number of times, from four to six, and at different seasons of the year from April to August. Without going into detail, it is sufficient to say, by the last of September there was not a leaf to be seen in the orchard, except on the sprayed trees. Those that had been sprayed several times, and especially those which had been treated for two years, were as rank and green with abundant foliage as they had been in the spring. It could be plainly seen, on the tall trees, how far the spray had reached; below the line the foliage was green and abundant, above that line the trees were as bare of leaves as in winter. Another noticeable feature was the difference in

the fruit-buds. On the unsprayed trees these were small, puny buds that could hardly be distinguished from leaf-buds. On the sprayed trees they were large and plump and gave every promise of abundant fruit. The trees sprayed in 1892 bore twice as much fruit in 1893 as the unsprayed trees did; while these same trees that have now been sprayed two years promise to do still better in 1894.

From a careful examination of the different plots, sprayed a different number of times and at different seasons of the year, we came to the conclusion that for that orchard two sprayings, one on June 1st and the other on June 15th, were for all practical purposes sufficient.

While it is not so necessary to spray the Bartlett Pear in neighboring orchards as it is in this one, there are nevertheless other varieties, such as Clairgeau, Flemish Beauty and Louise Bonne de Jersey, that are of little value without it, and are so much improved by it that the pears look like different varieties of fruit. Another point in favor of spraying the Bartlett is its effect in making the fruit hang longer on the tree, and as the late Bartletts sell the best, the crop will bring more money therefor.

The quince is another fruit that is greatly benefited by the Bordeaux mixture, and where it is applied regularly and systematically, year after year, this shy-bearing tree changes to a regular and abundant bearer of large-sized, handsome fruit, that colors up well and sells at the highest market price.

While farmers have been fortunate in securing good mixtures to combat plant-diseases and insect-enemies, and good pumps and nozzles to apply them with, they have not been so fortunate in getting machines to do the different kinds of spraying. While one machine will do good work in a potato-field, it will not answer in an orchard, while the machine that sprays the orchard will not suit the potato-field, and neither is suitable for Grape-vines, as they are not narrow enough to go between the rows. If the farmer has three machines, one for his potatoes, one for his orchard and another for his grapes, he still cannot spray Raspberries or Currants, because all three are too wide to go between them and too low to go over them, so that a fourth machine seems necessary for these crops. In addition, he needs a knapsack-sprayer, and this makes an expensive outfit. What is needed is a single machine so geared that it can be worked by one horse and can be adapted to do any of these different classes of work.

Roses.

PRIVATE establishments often lack space and proper facilities for forcing Roses, but if a pit or cold frame can be provided in addition to the conservatory, it will be possible to cultivate a few Hybrid Perpetuals in pots at this season, and the plants may be stored in the frame until it is necessary to bring them into heat.

Strong home-grown plants, on their own roots, are preferable for this purpose, although some of the imported stock is quite satisfactory if the plants have been worked low enough to bring the union beneath the soil in potting. In this case there is a possibility of the stem sending out roots above the graft. Additional strength is thus gained, but this is impossible with long-shanked Roses, such as are frequently sent to American auction-houses by some European growers. It is, therefore, safer to use good home-grown stock, with the reasonable expectation of some good flowers in due season. These Roses, which are potted in five, six or eight inch pots, according to size, when received in the fall, should be stored in a cold frame as soon as freezing weather sets in, the wood being shortened back with a sharp knife or shears. The plants can be brought into heat as they are needed, and started into growth gradually. A thorough watering is the first requisite to start the roots and buds into active growth. A slow start gives the strongest growth and finest flowers, and for a few days the Roses may be kept beneath the stage at the coolest end of the house. As soon as the buds break away the plants should be given all the light possible. Frequent syringing, and just enough water at the roots, are necessary, and it is essential to have as many roots as possible. As soon as the flower-buds show, fertilizers should be applied in the form of top-dressing or liquid-manure.

The plants should be started at a temperature of forty-five degrees, and the heat should be gradually increased by moving them to warmer parts of the house until a temperature of fifty-five to fifty-eight degrees is reached. In this way flowers may be grown of much better texture, and, consequently, more lasting, than those grown in a higher temperature.

The varieties that can be recommended for forcing in a private establishment include those most largely forced in commercial establishments, as Mrs. John Laing, Ulrich Brunner, Magna Charta, Anna de Diesbach, Madame Gabrielle Luizet, and, in addition, some that are not so widely grown, among which are Marie Baumann, Captain Christy, Countess of Oxford, Baroness Rothschild and Alfred de Rougemont, and, to round out a good dozen sorts, General Jacqueminot and Coquette des Blanches. If the conservatory is large enough to permit it, some use may also be made of pillar Roses, which may be planted out in a prepared bed at the foot of a pillar, and only trained enough to prevent their interference with other plants and to better display their own natural beauties. Two of the best sorts for this purpose are Lamarque and Maréchal Niel, and, though both are croppers, they produce such a wealth of bloom under the proper conditions that the flowering period is quite extended, and Lamarque has such bright and handsome foliage that it is ornamental when out of flower. But, to secure an abundance of the best flowers, these sorts should have a period of rest and then be started into growth, much the same as Grape-vines are started under glass.

Holmesburg, Pa. *W. H. Taplin.*

Greenhouse Climbers.

PLANTS of scandent habit are a great ornament to the greenhouse, and they are also useful for decoration in many ways. They should, of course, be carefully selected, for some are too vigorous for any but large structures, others are desirable for their neat and unobtrusive habit. The most important point at starting is the temperature of the house where the plants are to grow. A warm house with a minimum temperature of, say, sixty degrees will be a congenial home for any of the tropical climbers, even if it becomes a few degrees colder on very cold nights—indeed, it is better to let the house be a little cooler during severe weather than to attempt to maintain a greater heat with an arid atmosphere which always does more to promote the health of insects than that of plants. Climbers generally do best when planted out, but a free root-run is undesirable in certain cases, since it tends to an over-free growth that does not mature and will not flower freely. The failure of greenhouse climbers to flower freely may, in many cases, be traced to this cause, or to a lack of sun and air in summer and fall.

The most beautiful of climbing plants are, perhaps, the Dipladenias; they do not grow so rapidly as some others, but they flower better than most of them; the plants are decorative for at least six months of the year. The flowers can be used for table-decoration, and the delicate shades of pink and rose are most attractive, and they last long after being cut. The Dipladenias are natives of Brazil and will stand full exposure to the sun in summer; our plants grow and flower most satisfactorily at the end of the Rose-house, where the temperature is exactly what they require, both in winter and summer. They are not strong-rooted plants, and while they may do fairly well in a soil composed principally of loam, they much prefer being potted in rough fern-root or peat, made porous by liberal additions of sand and broken pots. This may seem a very poor compost to give the best returns, but if a healthy root-action is secured, stimulants can be applied when of most benefit to the plants, that is, during active growth and the flowering period. The best kinds we have are D. Brearlyana, D. amabilis, D. profusa and D. Houtteana; all of them have rose-colored flowers, and some turn to the richest crimson before fading. The plants rest in the winter, and in early spring they may be cut back, repotted and started again. The Mealy-bug is a great pest if allowed to get established, but a free use of the hose in the growing season is a sure cure for this pest, if applied with force and frequency.

Bougainvillea glabra is another free-flowering plant, and is not so often seen as it deserves. It is usually a summer bloomer, but by cutting it back in September we make sure of a good supply of its beautiful pink bracts in midwinter. The Bougainvillea requires root-restriction to induce it to flower abundantly; it makes too vigorous a growth if left to run as it will, and we, therefore, plant it out in a bench and put in well-cemented brick partitions. Like the Poinsettia, the bracts are the conspicuous part of the inflorescence, though to the casual observer these often pass for the flower proper. The Bougainvilleas are also Brazilian, but from the common name often given them, "Chinese paper-flowers," one would naturally suppose they were of eastern origin, more especially as the plant has spread with the advance of horticulture, so that it is more often seen in the far east than in the western hemisphere, and travelers agree in praising its beauties as seen in India. There is another species called B. spectabilis, which

has the best color of the two, but as it flowers on the growth made the preceding season, and requires a great deal of head-room, it is seldom seen. It flowers well every year at Wellesley, in the gardens of Mr. H. H. Hunnewell, where the plant occupies a section of a large span-roofed house. Those who possess a large house would do well to plant both these Bougainvilleas, as no insect pests, so far as I know, are to be feared.

Yet another climber from Brazil is Stigmaphyllon ciliatum, a plant with lovely yellow flowers, which at once suggest those of an Oncidium, so nearly alike are they in shape and color. The plant itself is of slender growth, and may be grown to advantage in a greenhouse in summer without overshading the other occupants. It flowers on the young shoots as they grow during summer. In the fall the plant should be cut back nearly to the soil-level, from which it will start again with the return of longer days and more sunshine in spring. The Stigmaphyllon requires a frequent syringing in hot weather, owing to its liability to attacks by red spiders. A free root-run is preferable, though I have had good specimens in pots, although the growth will not be so vigorous, nor will it flower so freely.

The Allamandas are well-known plants in gardens, especially A. Hendersonii and the larger-flowered species, but there is one very old kind called A. grandiflora, which has shoots no thicker than a goose-quill and bears flowers as large as the better-known kinds. I would be glad to meet with it again, if still in cultivation here. Owing to its slender growth, it is usually grafted on A. nerifolia, an easy operation, and one which adds vigor and hardiness at the same time. A. nerifolia will thrive in a temperature ten degrees cooler than the other species; it is of shrubby habit, and the flowers are not so large as those of others.

Most of the Passion-flowers are too vigorous for planting out in the greenhouse, they so soon overrun and make the house too dark for the other things; there is, however, one species not often seen, called P. Raddiana, better known as P. kermesina, one of the most beautiful, if not the best, of the genus. In this species the growth is twining and slender, and the flowers, as the older name suggests, are of the richest crimson, and borne in great profusion all summer. It is hard to account for the rarity of this Passion-flower in cultivation, but it can be accommodated in the smallest glass house. The corolla eventually reflexes with maturity and resembles a gigantic Cyclamen or the Gloriosa superba. Another good Passiflora, P. racemosa, is sometimes seen, but not frequently, owing to the difficulty of propagating it. This is the P. princeps of some catalogues, and it is a prince among its fellows in every respect, while the racemose character gave rise to its prior name; the racemes continue to flower all the season, and as the buds, as well as the expanded blossoms, are bright scarlet, it is most useful for decorating. The best way to propagate it is to root from cuttings one of the common sorts, such as P. edulis or P. Pfordtii, and then graft P. racemosa on the stocks thus secured. Passion-flowers are easily grafted at this time of year if a closed case is at hand in a warm-house, the operation being always interesting to the owner, especially as the plant develops into full flower and beauty. Grafting has been stigmatized as "a makeshift and a fraud," and with good reason in certain cases, but if the operator would always try and keep the union as near the soil-level as possible, we should not hear so many complaints, for the plant could be on its own roots the same season if the union, when complete, were buried under the soil. Plants are never slow to take advantage of a little encouragement given in this way.

It is hardly worth while to urge the more extended use of this class of plants, and yet many greenhouses fail to reach their highest possible attractiveness on account of their neglect. The bare frame and mechanism of the interior of a tropical greenhouse is often an eyesore; but with trailing plants, such as Cissus, Panicum, Tradescantia and Lycopodiums, planted so as to drape and fringe the edges of the benches, with Pothos, Ficus repens and others to climb up the dividing walls and partitions, and a few choice climbers garlanding the roof, a scene of truly tropical beauty is easily reproduced.

Boston. *Plantsman.*

Iris Palestina, which is now in flower, is an interesting plant, but not of much garden value, as the light yellow flowers are rather lacking in color. It can only be flowered in this climate in a cool house, where there is difficulty in ripening the bulbs. It is a native of Palestine and the Sinai Peninsula, and is a bulbous plant of the sub-genus Juno, the better-known forms of which are I. Caucasica and I. alata. The latter, by the way, is now in striking contrast as a first-rate plant, with very attractive flowers. I. Palestina is dwarf, with pointed sickle-shaped leaves, in two rows, between which the flower nestles. The flower is of light yellow, about the color of ordinary forms of I. Caucasica, though it varies somewhat in tones from opaque greenish yellow to bluish tints. The standards are minute. The blade of the falls is marked with blue or violet veins. The ridge of the fall is orange, and the claw is dotted with deep violet spots. The flower is fragrant, with less odor than that of I. alata. As far as my brief experience goes, this Iris and I. Varlini, which is also from Palestine, are the least satisfactory of the winter-flowering Irises. The latter species flowered last winter in the open, but quickly succumbed to the elements, and the bulbs seem to have disappeared. These are quite in contrast with the Irises of the Reticulata section, whose flowers, appearing a little later, will survive as much hardship as a Snowdrop. The first of these, I. Histrio, has its leaves well up now, and flower-buds are showing in the open, quite unprotected. The severe weather of a very changeable winter has had no effect on its foliage or on any part of the plant, except to scorch the tips of the stems slightly.

Elizabeth, N. J. *J. N. G.*

Correspondence.

Rust of Carnations.

To the Editor of Garden and Forest:

Sir,—Allow me to call attention to a statement of your correspondent, Mr. T. D. Hatfield, which might lead to misconception. Writing of Carnations, in your issue of January 10th, p. 17, Mr. Hatfield says: "Some growers date the appearance of the disease (Carnation rust) in their establishments to buying infected plants, and while this, no doubt, has been the means of spreading it, it has been generally noted hereabout that the disease appeared first in the open ground; and on examining many weeds, and particularly grasses in pastures, abundance of rust could be found; in some cases quite near to the Carnation patch." Doubtless these latter statements regarding the occurrence of rust-fungi (Uredineæ) on weeds and grasses are quite true, but, so far as we know, those species of rusts have nothing to do with the Carnation rust. The latter is due to a distinct species of fungus known as Uromyces caryophyllinus, and, so far as we know, is limited to Carnations. There is nothing whatever to indicate that this fungus has any genetic connection with, or can be produced by, those species which occur on "many weeds, and particularly grasses," nor that Carnations are exposed to attack through proximity to those species.

The common garden Pink, Dianthus barbatus, the near relative of the Carnation, is subject to the attacks of a rust-fungus, Puccinia Arenariæ, but, again, this fungus is quite distinct from the species which attacks Carnations. Puccinia Arenariæ is known to attack several weeds, such as Cerastium, Stellaria, etc., as well as Dianthus barbatus, but that it can be transferred to Carnations is out of the question. The rust of Carnations is, to a large degree, undoubtedly, propagated with the slips. The vegetative portion of the fungus, or mycelium, is perennial in the stalks and leaves of the plant attacked. There it may remain concealed for some time before it makes its presence evident by the production of the reproductive bodies or spores, which, from their color, give the name of rust to this group of fungi. The cutting of slips containing such concealed fungous threads, is not only a probable occurrence, but one which is practically unavoidable if there has been rust upon the plants; shortly after such slips are transferred to the open ground the fungus concealed within them develops its spores, and by means of the latter the fungus rapidly spreads from plant to plant. Of course, the most reasonable method of dealing with the pest is, as Mr. Hatfield remarks, to plant only rust-proof varieties. If, however, untested varieties are planted, care should be taken to secure sound and clean slips, and after these are rooted they should be sprayed with Bordeaux mixture. Constant watchfulness must be exercised, and slips which show the first symptom of rust must be promptly rooted up and burned. With this attention and care there should be little difficulty in contending successfully with the disease, even though there be weeds and grasses affected with another rust in the neighborhood.

New Haven. *W. C. Sturgis.*

Forest-lands for Investment.

To the Editor of Garden and Forest:

Sir,—I observe in an editorial article of your issue for November 1st, that Mr. Fernow is quoted as recommending forest-lands under regular management for long investments

This is an idea which I have long held. Many circumstances seem to me to co-operate in this direction. These are:

(1) The low figure at which even untouched virgin forest-land can be bought in certain places; (2) the steadily advancing price of timber; (3) the diminishing rate of interest; (4) the rise in the price of labor, which will be intensified by the restrictions placed upon immigration; (5) the growing desire to establish family property on a permanent basis.

The increasing price of labor has already begun to make agriculture difficult, and it will become more so, except on virgin or exceedingly fertile soils. Forests require much less labor.

All these facts tend to make it not unlikely that proprietors in some parts of the United States may, eventually, invest their money in forest-land, with a view, under regular management, of getting a moderate annual income, of steadily increasing the capital value of their estates and of eventually getting a large annual income. It seems to me that the man who first succeeds in setting the example in this respect, on a sufficiently large scale, will be the leader in what is destined to be a great movement.

Bonn, Germany. *Dietrich Brandis.*

Meetings of Societies.

The Nebraska State Horticultural Society.

THE twenty-fifth annual meeting of the Nebraska State Horticultural Society was devoted almost entirely to a discussion of the various phases of Apple-culture. In the opening paper on the "Botany of the Apple-tree," by Dr. Charles E. Bessey, it was stated that all of the varieties in cultivation, to the number of 4,000 or 5,000, have been produced from Pyrus sylvestris and the two botanical varieties of P. Malus. P. prunifolia has produced the Transcendent and Hyslop Crabs, and P. baccata, the older small Crab-apple of the garden. The Soulard Crab is the offspring of the American species, P. lowensis. Some of the species of the genus are of value only as ornamental trees, but several of them are even more promising in the wild state than the wild forms from which our common varieties have been derived. These offer a good field for experiment in determining their future possibilities. P. rivularis, of the Pacific coast, is especially promising in this respect. The fruit is about one inch in diameter in its wild state and possessed of a pleasant flavor. Although so widely distributed over the globe, no Apples are indigenous south of the equator.

Under the heading of the Tree in Health, attention was called to the matter of evaporation from the leaves, and emphasis laid on the fact that the escape of moisture from the leaf is purely accidental, and not a physiological function, as so commonly taught. The skin of the leaf is designed to retain moisture, just as the oiled-paper which a florist wraps around plants retains their moisture. The stomata, or breathing-pores, of the leaf are for the purpose of absorbing gases from the air. In doing this they allow the escape of moisture simply because the leaf can't help it.

Under the discussion of the Tree Diseased, the term disease was used in a broad sense and made to include starvation and other enfeebled conditions, as well as the effects of parasitic fungi. A tree may be just as truly starved in a fertile soil which is too hard for the roots to penetrate, or which is too dry, as in a soil deficient in plant-food. Too wet a soil, where the roots are submerged in water, may also induce starvation. Besides unfavorable habitat, unfavorable atmospheric conditions are also a cause of disease. For example, the severe droughts of the plains often injure trees. The exposed trunks may reach a dangerously high temperature in hot summer days. The extreme cold of winter is also doubtless injurious in many cases. Quick alternations are usually fatal. Sun-scald is probably due to this. Mechanical injuries are a third cause. Wounds, whether made purposely or otherwise, often afford means of access to bacteria and fungi. Every wound is a serious menace to the life of a tree. A tree may even perish from starvation, owing to a loss of leaves from insect-attack.

Parasitic fungi may cause: (1) Diseases of roots. The disease known as "root-rot," which is often quite serious in the west, is probably due to some of the toadstool fungi.

(2) Diseases of the trunk. One of the most serious of these is "rotten heart," probably due to one of the ear-shaped fungi found growing on the side of tree-trunks. This fact is not fully demonstrated, but the injury corresponds to the nature of that fungus, and it is known to cause just such injury in other parts of the world. The speaker had also found threads which looked like those of this particular fungus. The disease known as "black heart" was also mentioned with the statement that the cause is wholly unknown. Sun-scald, although so common, is not fully understood.

(3) Diseases of branches and twigs. The most important of these is blight, which affects all parts of the tree, including trunk, twigs and flowers.

(4) Diseases of leaves. These include powdery mildew, scab, rust and brown spot, a disease known to be very destructive in Virginia.

In a short paper on Apple-seedlings, D. U. Reed mentioned the importance of sowing the seed at a uniform depth, since a seedling will grow only to a given height and then perish if not above ground. He sows one inch deep, and prefers to sow in February or March in this section, sowing the seed dry, just as it comes from the seed-houses. If it is to be sown later it should be first soaked, then dried enough to sow with a drill. Especial emphasis was placed on the importance of frequent surface-cultivation to hold and accumulate moisture.

A paper on "Experimental Orcharding in Nebraska," by Peter Youngers, Jr., showed forcibly the unprofitableness of planting many varieties. Of sixty varieties planted nineteen years ago the majority have failed, principally from blight. He now keeps his experimental orchard away from his main orchard in order to avoid spreading this disease. Forty Ben Davis trees have averaged ten bushels per tree four times since planting. He would not recommend over ten varieties for general planting. These are Early Harvest, Duchess and Cole's Quince for summer, Wealthy and Snow for fall, and Ben Davis, Winesap, Grimes's Golden, Missouri Pippin and Janet for winter. The Early Harvest does not bear young, but it is hardy and improves with age.

The subject of propagation was treated by G. J. Carpenter, who recommended root-grafts with a two-inch piece of root and a six-inch cion, planted seven inches deep, in order to throw the tree on its own roots. Budded trees are objectionable on account of throwing up many sprouts; they are not so good as root-grafts in the west. Practically, no whole root-grafts are used. Several years' experimenting has shown no difference between collar-grafts, middle cuts and low cuts. The past season, the best growth was from the lower cuts of No. 2 seedlings. Ben Davis, Gros Pomier and Whitney are admirable stocks for this region. Gros Pomier, in regions where it matures early, will hasten the maturity of the variety grafted on it.

On the subject of "Commercial Orcharding," President Stephens stated that the key to success lay in cultivation. He believes that we have never secured all the possible advantage of cultivation in conserving moisture. Tillage should be repeated every ten days at least from May 15th to August 15th. Cultivation very nearly takes the place of irrigation in parts of California. This is also true in Nebraska in nursery work, and is no reason why it may not also hold true in fruit-growing. In the discussion of this paper, the significant fact was brought out that in collecting fruit for the Chicago Exhibition it was only from those men who were giving thorough cultivation that any apples could be obtained. Some prefer to keep cultivating as long as the weeds grow. Mr. Stephens has gathered 1,000 bushels per acre several times. His practice is to plant close, and thin out after the trees have borne several crops.

Professor Sweezy, of Crete, presented an interesting paper showing the relation between the apple crop and the rainfall during a number of years past. His estimates of the apple crop of various years were obtained from a number of growers. Charts, with lines representing the abundance of a crop in the different years, showed a very close resemblance to the lines representing the annual rainfall of those years. If only the total rainfall during the growing season, from May 1st to September 1st, is considered, the correlation is almost perfect. While other causes must influence the crop to a certain extent, the rainfall appears to be the most important factor in south-eastern Nebraska. It demonstrates forcibly the necessity of conserving all the moisture possible by thorough and persistent cultivation. The statement is frequently made that the rainfall of the state is increasing with the increase of cultivation and timber-planting, but the weather records do not show this to be a fact.

Mr. I. N. Leonard, of Lincoln, gave a report of progress on an interesting method of tree-planting first suggested by him. Much of the soil about Lincoln, and in some other parts of the state, is underlaid with a hard pan of clay so dense that the roots of trees will not penetrate it. Mr. Leonard's method is to dig large holes four to six feet deep, or through this stratum of clay, if possible, then to fill these holes with good surface-soil, and there plant his trees. Thus far this method has given

him trees free from blight and sun-scald, but the experiment has only been in progress about two years. He now finds that in a field of four acres, in which 150 of these holes have been dug, the underlying clay is very much softened, so that holes can be dug much more easily than formerly. This he considers to be due to the action of the water which has thus been allowed to permeate through and beneath this hard stratum.

Notes.

Although Nebraska stands the lowest among the prairie states in the proportion of woodland to farmland, yet the forestry exhibit at Chicago last year demonstrated the capacity of the state for growing timber. The largest specimens of White Elm, Hackberry, White Cottonwood, White Maple, Box Alder and planted Catalpa were shown by this state, and larger specimens of planted timber-trees than those from any other state.

Colonel Philo Hersey, at a recent convention of California fruit-growers in San Francisco, stated that enough Prune-trees are now planted in that state to produce, after a few years, 100,000,000 pounds of cured prunes annually. An immediate question in relation to prunes is, whether they shall be graded according to size alone, or as is largely the practice in the Santa Clara valley, according to their saccharine contents. The richest prunes, from lack of irrigation and other causes, are often smaller than the insipid fruit grown on wet lands, or under other conditions favoring size at the expense of quality.

The *Rural New Yorker* has gathered a number of opinions concerning the Horticultural Lima Bean from various sources, and the testimony seems to be that it is earlier than other Pole Beans; that it is hardy and productive. It can be used as a snap bean, but it is neither as good nor as early as some of the bush varieties for this purpose, but as a green shell-bean it is of excellent quality, although it has the fault of a dark disagreeable color when cooked. The Bean originated with Mr. J. H. Hodges, of Vermont, in 1885, and it is supposed to be a cross between the Challenge Lima and the old Horticultural Pole Bean.

The January number of the *Botanical Magazine*, which begins the one hundred and twentieth volume of this work, contains a figure (t. 7335) of the north China Prunus humilis, which was first described as long ago as 1733 by a French missionary in China, Dominicus Parennin, under the name of Oolana, the Mongolian and Manchurian name of this plant. Prunus humilis is an old inhabitant of the Arnold Arboretum, having been first raised there from seed sent from Pekin by Dr. Bretschneider. Sir Joseph Hooker retains Bunge's name of Prunus humilis, while pointing out the fact that it had been changed by Walpers to Prunus Bungei on account of an earlier Cerasus humilis, a native of Sardinia, and now thought to be a variety of Prunus prostrata. Prunus humilis, or Bungei, is a dwarf and exceedingly hardy shrub that blooms profusely every spring and bears abundant crops of bright red fruit, rather less than half an inch in diameter.

Since it has been found out that the peculiar muck-soil of certain swamp-lands is especially adapted to the cultivation of Celery, an increased acreage of such land is devoted every year to raising that vegetable for market, and in some places, especially in Michigan, its cultivation has become a very large industry. When this plant was first introduced, and raised only here and there, few insects attacked it, but many of our native insects have acquired a liking for it, so that the species which attack Celery have rapidly increased in number and in the severity of their attacks. Bulletin 102 of the Agricultural Experiment Station of Michigan, which is devoted to these insects, will, therefore, be especially welcome to all commercial growers as well as the owners of private gardens. A very complete history of the various insects which have been found to injure Celery, together with the most available methods of preventing their ravages, are here set forth in about thirty pages of carefully illustrated text.

The season's shipments of raisins from California up to the 1st of January amounted to the enormous total of 64,000,000 pounds, which, estimated on the basis of 20,000 pounds to a car, would show that 1,000 more car-loads were shipped last year than the year before, when the crop required 2,200 cars for removal. It is estimated that from 350 to 400 car-loads of raisins yet remain on the Pacific coast, where they are held for higher prices. The hopes of an increase of price are stimulated by the fact that there are very small supplies of foreign raisins now in the hands of importers here, and they will hardly be imported in quantity at present prices. It may be added here that while the California Fruit Union reports a large increase of shipments of all kinds of fruit from California last year, the receipts were not so large as they were the year before. To show the great cost of handling fruit, it is stated that on sales amounting to $2,046,404 the expenses for freight, refrigerator service and commission were $1,127,497.

In December last (see Garden and Forest, vol. vi., p. 516) we gave an account of some experiments by Professor Lazenby at the Ohio State University, setting forth the advantages of applying water under the surface of the soil in forcing-houses and hot-beds, and of using a similar system of irrigation and drainage combined for the outdoor garden. Experiments in the same direction have been made in the West Virginia Agricultural Station, and the result is recorded in Bulletin No. 33. The practical conclusions are that, with good judgment on the part of the operator, sub-irrigation will be found preferable to watering on the surface. Some points gained by this system are that the soil does not become hardened on the surface, nor does it bake and dry out on the bottom; time and labor are both saved, less water is needed, and the soil can be worked at any time; good drainage is secured, and the soil is free to admit air, and therefore does not become sour or stagnant. In the West Virginia experiments Spinach matured earlier; Lettuce, Radishes, Tomatoes and Parsley were benefited; the plants attained more even size, and fungus diseases were not so prevalent.

Mr. Edwin Molyneux has published his annual analysis of the relative positions of the varieties of Chrysanthemums grown for exhibition in England, and it appears in the current issue of the *Journal of Horticulture*, the flowers being ranked according to the number of times they were shown at the exhibitions of the National Chrysanthemum Society for the last nine years. The first fact prominently brought out is that the Japanese varieties have grown much more rapidly in favor with exhibitors than have the incurved sorts. Of this latter class the old favorites still lead the list. The Empress of India is still number one, followed by the Queen of England, Lord Alcester, Golden Empress of India, with Madame Darier for the fifth, a variety which was not sent out until 1890. This new variety was shown oftener last year than any other of the incurved kinds, except Jeanne d'Arc, which stands sixth on the list, and is followed by the Golden Queen of England, Princess of Wales, Mrs. Violet Tomlin, Miss M. A. Haggas, Lord Wolseley and Alfred Salter. Old favorites in the Japanese section are more rare, and they seem to be more rapidly replaced by the newer kinds. The leading variety in this class is Viviand Morel, which was introduced as late as 1891, and was the sensational flower at the exhibition in the next year. The list continues in the following order: Edwin Molyneux, Avalanche, Sunflower, Etoile de Lyon, Florence Davis, William Tricker, Colonel W. B. Smith, W. H. Lincoln, Gloire du Rocher, Monsieur Bernard and Stanstead White.

The importations of bananas during December were unusually large, and this fruit then sold on the dock as low as twenty cents a bunch for No. 3 size. Only eight steamer-loads arrived during the first three weeks of this month, and with the market clear of old stock, bunches of the first grade sold as high as $1.22 at the vessel's side, No. 3 bringing from forty to sixty cents a bunch. During the early part of January oranges were leaving Florida at the rate of 35,000 boxes a day, as many as 98,000 boxes coming to this city in one week. Prices have been so low as to net the growers only fifty cents a box. Desirable sizes of good Florida oranges are $1.50 to $1.75 a box at wholesale, and the best Navel oranges are but $3.00. The first California oranges of this season reached New York last Friday. Bright Riverside Navel fruit of good quality is offered at wholesale at the same price as Florida oranges of the same grade. A number of car-loads of California oranges are in transit, so that this fruit will soon be fairly on the market. Among vegetables, lettuce of ordinary quality hardly brings enough to pay expenses, while the finest from Florida and Charleston is worth $2.00 a basket, and the best Boston hot-house lettuce is seventy-five cents a dozen heads. Cauliflower from California, chicory from New Orleans, new beets from Florida and Bermuda, green peas, string beans and egg-plants from Florida, cucumbers from Key West, tomatoes from Havana and Florida, and kale, spinach and radishes from Norfolk are among the common offerings in the midwinter market of this city. A few strawberries, from California, of not the best quality, were seen here during the holidays, and within a few days past the first pickings of the new crop in Florida were sold here at $2.50 a quart.